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Economics of Building Up A Run Down Dairy Farm in Southeastern Ohio

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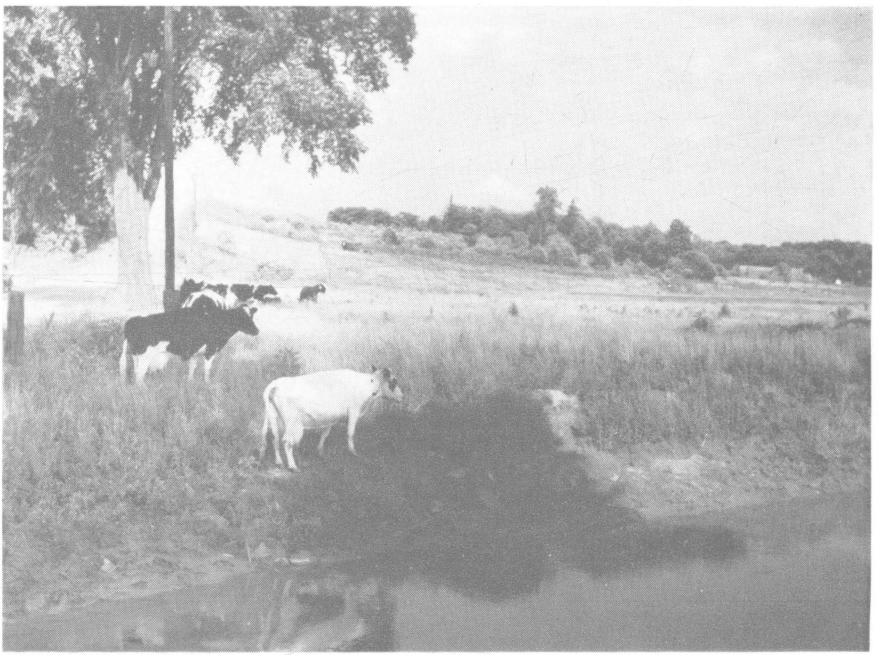

OHIO AGRICULTURAL EXPERIMENT STATION

WOOSTER, OHIO

CONTENTS

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ECONOMICS OF BUILDING UP A RUN DOWN DAIRY FARM IN SOUTHEASTERN OHIO

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CONCLUSIONS

Above average management is needed if farm earnings are to finance the practices and operations required to restore the productive capacity of a run-down farm in southeastern Ohio. This conclusion is based on income calculations for a typical size dairy farm of 120 acres.

With top grade management (10,000 pounds of milk per cow and $4.00 net per hundredweight for grade A milk) soil building operations could be financed out of farm earnings in a few years. If this type farmer owned all capital required and charged nothing for the use of it, farm earnings would be sufficient to pay him more than the average farm wage rate after the first year. If he charged 4 percent interest on capital needed, he could allow himself more than customary wages after the third year.

Stated somewhat differently, after three years of top grade management a reserve should accumulate to pay previous costs provided labor is allowed no more than $ .75 an hour and capital 4 percent.

With average management (7,000 pounds of milk per cow and $3.00 net per hundredweight for manufactured milk) farm earnings from a soil improvement program would pay labor and capital only slightly more than average rates after the twelfth year had been reached. Therefore, financial reserves would accumulate so slowly that about 45 years would be needed to repay all previous costs.

Average farmers would have considerable difficulty financing the soil building program out of farm earnings if they allowed labor the prevailing rate of $ .75 an hour plus the use of a house and paid capital 4 percent interest. Even if they owned all capital needed and charged nothing for the use of it, they would not be able to pay themselves average farm wages until the seventh year of the program.

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[1]Helpful suggestions in designing this study and reviewing results were made by Mervin G. Smith and J. H. Sitterley of the Department of Agricultural Economics and Rural Sociology.

If any capital were borrowed additional income would be needed to make repayment on principal. Since most lending agencies require some repayment on loans each year, it is difficult to imagine how an average farmer could borrow any sizeable amount of money on the soil building program studied. For the first 11 years, labor and capital could not be paid average rates. From the twelfth year on labor and capital could be paid average rates, but only about $200 each year would be left over to pay previous costs or make repayment on any outstanding loans. With average management some off-farm income usually will be needed to finance the early stages of a soil improvement program. Below average management would make the program still more difficult to finance.

Although a soil building program may be profitable with the right kind of management, returns from a given amount of labor and capital applied to a highly productive farm could often be more profitable. Also a job in town might still be a better alternative, especially for an average farmer who does not possess the necessary skills and capital needed.

Computations in this study apply to Muskingum and associated soils which extend over about one-half of southeastern Ohio. These soils erode easily when cropped because most slopes range from 10 to 30 percent. Soils maps show that on much of the cropland over half of the original topsoil has been lost.

Crop production data used in calculating income were obtained from three surveys of Coshocton County farms. Prices used were averages for the five year period 1950-54.

Receipts, expenses, and net income were calculated for three complete crop rotations. Observations indicated that this length of time should be sufficient to obtain most of the benefits from the soil improvement program.

INTRODUCTION

Many studies show that highly productive farms yield greater profits than ones with badly depleted resources. But few studies show whether soil improvement programs can be financed out of current farm earnings.

The purpose of this study was to determine the profitability of restoring the productive capacity of a farm with badly depleted resources. To accomplish this objective, detailed consideration was given to the following items: (1) annual receipts, expenses and net

income for the period of time needed to maximize farm earnings, (2) fixed and operating capital needed to make the necessary improvements, and (3) level of management required to make the soil building program profitable.

Soil improvement programs may increase net income after they have been in operation for a period of time. But during the period of establishment expenses may be greater than receipts especially if labor and capital are paid customary rates. For example, costs of liming cropland may not be completely recovered on some farms until a meadow crop can be produced and marketed through livestock. Several years usually are required before benefits of permanent pasture improvement are fully realized. Alfalfa meadows cannot be expected to increase corn yields until sufficient time has elasped to raise them and then plow the residues under. Even after a crop of corn is raised additional time may be needed to convert it to animal products.

METHOD OF STUDY

Receipts, expenses, and net income for rebuilding the productive capacity of a run-down farm were calculated by the method commonly called farm budgets. This procedure was used so that all factors could be held constant except the ones under consideration at a particular time. Actual income data would not have given satisfactory figures because many changes in farming could have occurred along with establishing a soil improvement program. In recent years farmers have adopted many practices that have no relationship to maintaining or improving soil productivity. Therefore, these practices must be held constant by designed experiments or farm budget calculations, if the economic aspects of soil improvement programs are to be evaluated properly.

Capital requirements, livestock numbers, labor needs, and net income were calculated for 30 different farming situations. Six different levels of milk production and five different milk prices were used in making these computations. For each situation, calculations were made for a 13-year period which was long enough to cover 3 complete crop rotations. Observations indicated that this length of time should be sufficient to obtain most of the benefits from the soil improvement program.

SOURCE OF DATA FOR CALCULATIONS

Input-output data used in calculating net income were supplied by three studies made on hilly farms in Coshocton County. They included the following:

(1) A study of 75 farms on which data were collected on land use, fertility practices, crop yields, and livestock numbers for 1952. About two-thirds of these farmers were following most of the soil conserving recommendations made by the local soil conservation district. The remainder could be rated poor from the standpoint of soil conservation.

(2) A study of crop production, livestock numbers, and farm income on six farms for the period 1937-49. All of these farmers had improved their farms according to the recommendations of the local soil conservation district.

(3) A study of crop production, fertility practices, and livestock numbers on 52 farms in 1946. These farms varied considerably in the amount of soil conserving practices used.

DESCRIPTION OF FARM IN RUN-DOWN STATE

This farm consisted of 120 acres of hill land on which soil depleting practices had been followed for more than 25 years. No mechanical measures such as terracing or contour strip cropping had ever been established. Fertilizer applications on rotated crops averaged only about 50 pounds per acre per year for the last 10 years. Practically no lime had ever been applied to the cropland. Soils were too acid to grow legumes and timothy was the principal meadow crop.

Soils maps showed that Muskingum and associated types predominate on this farm. These soils extend over about one-half of southeastern Ohio. Usually, they are steep with slopes ranging from 10 to 30 percent. Muskingum soils are unglaciated and have developed from sandstone and shale. They are acid in reaction except where liberal amounts of lime have been applied recently. Maps also showed that cropland on this farm had lost over one-half of the original topsoil. Sheet erosion caused most of this loss; but a few shallow gullies also existed where water concentrated as it ran down the slopes.

Approximate yields per acre were as follows: corn, 35 bushels; wheat, 18 bushels; and hay, 1.0 tons. Permanent pasture yields also were low because no lime or fertilizer had ever been applied to this crop. Although soil productivity had been badly depleted, buildings for livestock were still in fair condition. Also, the farm house could still be used without making major repairs. Fences were average to poor. But no major clearing of brush was needed on either the cropland or permanent pasture areas.

Profits from this system of farming were low. For example, with cows averaging 7,000 pounds of milk selling at $3.00 per hundred pounds, labor would receive only about $ .50 an hour if no interest were charged on capital invested. But if a 4 percent interest charge were made, this figure would be reduced to about $ .20 an hour.[2]

This farm is not the poorest one that could have been studied. A farm with practically no buildings could have been used. Also, a farm might have been selected on which considerable clearing of brush was needed on both the cropland and permanent pasture areas. Farms in this classification were not considered because observations indicated that they were rarely operated as single units after buildings were unusable and clearing was necessary. Usually such tracts of land were added to adjoining farms which still had adequate buildings and at least an average capacity to produce.

TABLE 1.—Land Use* Pattern for Rebuilding a Run Down Farm

Land Use	Acres†
Corn	12
Wheat	14
Meadow	34
Rotated Land	60
Permanent Pasture	36
Woods	17
Miscellaneous	7
Total	120

*Except first year when rotated acreage was: corn, 12; wheat, 0; and meadow, 48. No wheat was assumed to be harvested the first year because this crop had to be planted the year preceding harvest.

†Acreages in grain crops on this farm are slightly above the average for the nine Southeastern Ohio counties where Muskingum soils predominate. This may be partially explained by the fact that the farm used in this study represents units where agriculture is the principal source of income, whereas the data for the nine counties included many part-time farmers. Census data for 1949 showed that size of farm averaged 121 acres for the nine counties. Acres in specific crops were: corn, 9; small grain, 8; meadow, 35; permanent pasture, 34; woods, 24; and miscellaneous, 11.

[2]Based on 1950-54 prices. Calculated receipts were $3185; expenses were $2150 when no interest was charged against capital, and $2780 when a 4 percent rate was assumed to be paid. Labor requirements were estimated to be 2025 hours.

CROP PRODUCTION DATA USED FOR MAKING INCOME CALCULATIONS

Land Use. All calculations that follow are based on the crops assumed to be produced on a 120 acre farm operated by the owner. Census data showed that this is a typical size farm for southeastern Ohio. Acreages of specific crops are shown in Table 1. About half of the total farm area could be used for rotated crops provided contour strip cropping was followed. But the remainder of the farm was suited only for permanent pasture and woods because of steep slopes. This land use classification was determined from soil capability classes used locally to develop cropping programs to control erosion and improve soil productivity.

Meadow acreage was slightly greater than corn and wheat combined although a four-year rotation of corn, wheat, and two years of meadow was used. Correction areas produced by contour strip cropping accounted for this difference. Contour strip cropping was considered necessary to maximize grain acreage and control soil losses by erosion.

Crop Yields. Total crop production on the rotated land was calculated from the yields in Table 2. These yields were based on the use of contour strip cropping and heavy applications of fertilizer and lime. Therefore, they are considerably higher than the yields obtained under the system of farming that depleted soil productivity.

Fertilizer applications on corn were assumed to be 350 pounds per acre of a single strength analysis. For wheat 450 pounds were used. First year meadows were assumed to be top dressed with 200 pounds per acre after making the first crop of hay. Costs of lime were calculated on the basis of needs as shown by soil tests. Four tons of agricultural ground limestone were used for the initial application; two tons were figured for the next rotation; and one ton every four years was used thereafter for maintenance.

Rotation pasture yields were based on the type and amount of hay assumed to be raised. The carrying capacity of permanent pastures was determined from experimental data.[3] Costs of permanent pasture improvement were calculated from the following applications of lime and fertilizer: three tons of agricultural ground limestone per acre for the initial application followed by one ton every four years; and 600 pounds of single strength fertilizer every three years.

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[3]Dodd, D. R. Good Pasture. Ohio Extension Bulletin No. 345, August, 1954.

TABLE 2.—Crop Yields for the Soil Rebuilding Program

Crop	Rotation			
	First*	Second	Third	Fourth
Corn, bu.	50	58	62	65
Wheat, bu.	22	24	25	26
Hay, tons	1.0†	2.0‡	2.5§	2.8§

*Even for the first rotation grain yields for this farm were slightly above the average for the nine Southeastern Ohio counties where Muskingum soils predominate. Yields for these counties averaged 46 bushels for corn and 21 for wheat for the period 1944-53. Heavier applications of fertilizer accounted for these differences in yields. Hay yields averaged 1.4 tons per acre for the nine counties.

†Timothy only.

‡Red clover and timothy with some alfalfa.

§Alfalfa, clover and timothy.

AMOUNT OF LIVESTOCK THAT COULD BE KEPT

The amount of livestock that could be kept on the feed assumed to be produced is shown in Table 3. Ohio livestock feeding standards[4] were used in figuring feed requirements for each animal. The number of dairy cows and replacements was determined from the amount of hay and pasture the farm would produce. The number of hogs was based on the amount of corn left after deducting the requirements for the dairy herd.

Dairy cows were calculated to double during the 13 year period. The number of hogs did not change significantly when 7,000 pound cows were used. But with 10,000 pound cows, hog numbers for the thirteenth year were only about one-half the amount for the first year. Forage consumption per cow was assumed to be the same regardless of milk production. But the high producing cows were allowed 1,000 pounds more grain than the low producing ones. Therefore, less grain was available for hogs when high producing cows were used instead of low producing ones. Also, as more 10,000 pound cows were assumed to be kept, less corn was available for hogs.

Dairy cows were selected to utilize the hay and pasture because this type of livestock prevails on many southeastern Ohio farms. Beef cattle and sheep were not considered because they would require more

[4]Sitterley, J. H. Rates of Feed Consumption by Livestock. Department of Rural Economics, Ohio State University, Extension Bulletin 308, May, 1949.

than 120 acres to use all of the labor of a full time farmer. A small flock of poultry might have been considered in the livestock program, but this enterprise was omitted to simplify calculations. One or two hundred hens would not have changed conclusions significantly. Poultry would only have substituted for some of the hogs because both are principally grain consuming animals.

TABLE 3.—Calculated Livestock Numbers for a 120 Acre Farm

Year	Dairy cows	Replacements for old cows	Market hogs with	
			7,000 lb. cows	10,000 lb. cows
1st	10	0	27	23
2nd	10	0	26	21
3rd	10	4	26	20
4th	11	4	25	18
5th	12	4	30	23
6th	13	4	29	21
7th	14	4	28	18
8th	15	4	27	15
9th	16	5	29	16
10th	17	5	28	14
11th	18	5	27	12
12th	19	5	26	11
13th	20	4	28	11

CALCULATED INCOME FOR COWS PRODUCING 7,000 POUNDS OF MILK SELLING AT $3.00 PER HUNDREDWEIGHT AFTER DEDUCTING HAULING CHARGES

Capital Invested. Profits from this kind of cow and price for milk will be discussed in detail because these conditions are found on a large number of farms in southeastern Ohio.

This production per cow is about the average for the state (6,800 pounds for 1955). This price for milk is about the average paid for manufacturing purposes ($2.90 for 3.5% milk for 1950-54). Estimated capital requirements for this type of farming are shown in Table 4. Capital inventments were estimated as follows: First the value of land was increased each year by an amount equal to the cost of lime

TABLE 4.—Estimated Capital Invested* for 7,000 Pound Cows and $3.00 Net per Hundredweight for Milk

Year	Land and Fences	Buildings†	Machinery	Livestock	Total
1st	$3,000	$6,000	$5,000	$2,200	$16,200
2nd	3,800	5,880	5,000	2,600	17,280
3rd	4,200	5,760	5,000	3,000	17,960
4th	4,600	5,640	5,000	3,200	18,440
5th	4,700	5,520	5,000	3,400	18,620
6th	4,800	5,400	5,000	3,600	18,800
7th	4,900	5,280	5,000	3,800	18,980
8th	5,000	5,160	5,000	4,000	19,160
9th	5,000	5,040	5,000	4,300	19,340
10th	5,000	4,920	5,000	4,600	19,520
11th	5,000	4,800	5,000	4,800	19,600
12th	5,000	4,680	5,000	5,000	19,680
13th	5,000	4,560	5,000	5,000	19,560

*Based on 1950-54 prices.
†Does not include facilities to produce grade A milk.

used in excess of maintenance applications. This procedure increased the inventory value of land from $2500 to $4500 during the 13 year period. Buildings were depreciated at the rate of $120 per year. This reduced their value from $6,000 to $4,560. Values placed on land and buildings fall within the range of local real estate prices.

Machinery investment was kept down to $5,000 by assuming that some second hand equipment would be used. Also, custom owned machinery would be hired to harvest the corn and wheat. But a hay baler was considered necessary to harvest the meadows at the proper time. Annual investment in machinery was kept the same by assuming that some new pieces would be bought occasionally.

Livestock was increased in value from $2,200 the first year to $5,000 for the thirteenth year. Greater numbers accounted for the larger value. Total capital invested increased from $16,200 to $19,560. Higher land values and more livestock in the thirteenth year were responsible for this increase.

Receipts. Calculations showed an increase in gross receipts from $3,132 to $6,532 during the 13 year period (Table 5). This doubling of receipts came principally from raising the sale of milk and old cows from $2,052 to $4,852. More hay and pasture made this increase

possible. Annual sales of hogs and wheat did not change significantly. Hogs accounted for about $1100 gross income each year while wheat added about $500, except for the first year. Wheat sales included about three-fourths of the total crop produced, the remainder being fed to hogs.

Prices used in calculating gross income were averages received by Ohio farmers for the five year period 1950-54. Averages for this period were used to minimize effects of short time changes in price relationships. The price of milk used was $3.00 per hundred pounds after deducting hauling charges. The price used for hogs was $20.00 per hundred pounds. Wheat sales were figured at $2.00 per bushel.

Expenses. Estimated expenses are shown in Table 6. Although the annual costs of a few items changed significantly, total operating expenses remained at about $3000 throughout the 13 year period. Hay and pasture improved enough to keep the annual feed bill around $600, even though the number of cows was calculated to double. Machinery costs were increased because of harvesting more hay for the additional livestock. Costs of lime were extremely heavy for the first three years. Smaller applications would have reduced immediate costs. But less

TABLE 5.—Calculated Receipts for 7,000 Pound Cows and $3.00 Net per Hundredweight for Milk

Year	Dairy	Hogs	Wheat	Total
1st	$2,052	$1,080	$ 0	$3,132
2nd	2,052	1,040	486	3,578
3rd	2,052	1,040	486	3,578
4th	2,787	1,000	492	4,279
5th	2,997	1,200	466	4,663
6th	3,207	1,160	528	4,895
7th	3,405	1,120	532	5,057
8th	3,615	1,080	538	5,233
9th	3,825	1,160	528	5,513
10th	4,210	1,120	560	5,890
11th	4,432	1,080	566	6,078
12th	4,642	1,040	570	6,252
13th	4,852	1,120	560	6,532

TABLE 6.—Estimated Expenses* for 7,000 Pound Cows and $3.00 Net per Hundredweight for Milk

Year	Feed	Machinery	Lime	Fertilizer	Other	Total
1st	$760	$402	$1,032	$406	$696	$3,296
2nd	624	626	624	406	824	3,104
3rd	587	710	624	474	831	3,226
4th	566	700	258	474	845	2,843
5th	620	694	258	474	857	2,903
6th	645	710	258	474	869	2,956
7th	627	726	258	474	881	2,966
8th	581	747	156	474	891	2,849
9th	614	773	156	474	903	2,920
10th	629	789	156	474	915	2,963
11th	621	805	156	474	925	2,981
12th	632	815	156	474	936	3,013
13th	659	815	156	474	929	3,033

*Includes only cash expenses when no capital is borrowed. Does not include charges for the operator's labor or interest on investment. Depreciation on buildings given in Table 4.

lime in the early years of the soil improvement program would also have delayed the time when maximum benefits could be realized. Fertilizer costs were lowest for the first two years because none was used on the meadows.

Other expenses included an annual charge of $204 for seed, except for the first year when no clover seed was sowed. Also an annual charge of $210 was made for building and fence repairs. Taxes and insurance varied only from $196 the first year to $228 for the thirteenth because depreciation of buildings offset some of the increased value of crops and livestock.

Net Income. Returns to labor were calculated two different ways. One omitted any interest charge on capital invested. The assumption was made that no capital would have to be borrowed. Consequently, no cash outlay would have to be made for interest payments. The other method of calculating net income included an average interest charge of four percent on land, buildings, machinery and livestock. Borrowed capital usually costs more than this amount. But capital owned usually returns less if invested where no great risk is involved.

Net income figures showed that labor could not be paid anything out of farm earnings the first year, even if no interest charge were made on the capital invested. Cash expenses alone for the first year would amount to $164 more than gross receipts. If a four percent interest charge were made against capital, farm earnings would not be sufficient to pay labor anything before the fourth year (Table 7).

For the 13-year period as a whole, returns to all labor would average only about $ .73 an hour if no interest were charged on capital. But if four percent interest were charged, this figure would be reduced to $ .45.

These computations show some of the difficulties of financing the early stages of the soil rebuilding program from the earnings of the farm. From 1950-54 Ohio farm wages averaged about $ .75 an hour plus the use of a house. But the soil building program would not return this much to labor before the seventh year, even if no interest were charged on capital invested. If a four percent interest charge were made, the average farm wage rate could not be paid out of annual farm earnings until the twelfth year. These figures do not include credit for any increase in the inventory value of capital investments which amounted to $3,360 during the 13-year period. Since these additional investments were in the form of lime and livestock, they could not be used in any way for operating expenses or repayment of loans. If this amount had been credited to labor earnings for the 13-year period it would have increased them about $ .10 an hour for all labor used.

During the first 11 years, total expenses would amount to about $7,340 more than total cash receipts plus a $3400 inventory increase in land and livestock. For the twelfth year receipts and expenses would be approximately equal. But from the thirteenth year on receipts would be about $200 greater than expenses. Therefore, about 45 years would be needed to repay all previous costs of the soil improvement program, if the farmer received $ .75 an hour for his labor plus the use of a house and capital were allowed a 4 percent interest charge.

If any capital were borrowed additional income would be needed to make repayment on principal. Since most lending agencies require some repayment on loans each year, it is difficult to imagine how any sizeable amount could be borrowed on the farming operations just described. If $2,500 were used annually for family living expenses, no payment of interest or principal could be made out of farm earnings before the ninth year.

TABLE 7.—Calculated Income and Labor Requirements for 7,000 Pound Cows and $3.00 Net per Hundredweight for Milk

Year	Labor income with		Return per hour of labor with		Hours of labor needed
	No interest charge	4% interest charge	No interest charge	4% interest charge	
1st	—$ 164	—$ 812	—$ .09	—$ .43	1,908
2nd	474	— 217	.23	— .10	2,100
3rd	352	— 366	.16	— .16	2,244
4th	1,436	698	.61	.30	2,346
5th	1,760	1,015	.71	.41	2,485
6th	1,939	1.187	.74	.46	2,604
7th	2,091	1,332	.76	.49	2,735
8th	2,384	1,618	.83	.56	2,867
9th	2,593	1,819	.86	.60	3,018
10th	2,927	2,146	.94	.69	3,121
11th	3,097	2,313	.97	.72	3,204
12th	3,239	2,452	.99	.75*	3,278
13th	3,499	2,717	1.04	.81	3,356
Average	$1,971	$1,223	$ .73	$ .45	2,713

*A financial statement for the first 11 years (until annual receipts would be sufficient to pay labor and capital average rates or more) showed the following: total cash receipts, $51,896; expenses, including a payment of $ .75 an hour for labor and four percent interest on capital, $62,636; increase in capital invested, $3400; loss, $7340.

How then could such a program be financed with average cows and milk prices? It might be done by using capital on which no interest had to be paid. Also, some off-farm income might be used to support the family during the first few years of the rebuilding program. At that time labor requirements would be about 1000 hours less than needed in the thirteenth year. A slow rate of adopting a soil improvement program might be used to keep annual expenses down. But it also would delay the time when the program would yield the greatest income.

Preceding calculations were not based on the poorest farm obtainable. The assumption was made that buildings for livestock were still usable after making minor repairs. Construction of a new barn would increase building investment at least $3000 above the figures used in Table 4. Additional buildings would increase capital needs, depreciation, repairs and interest. The net effect would be still lower returns for labor.

The assumption also was made that one ton of timothy hay could be harvested before any improvements were made. Extremely run-down farms may produce considerably less than this amount. A smaller hay yield for the first few years would give less income than preceding calculations indicate.

Sometimes a considerable amount of brush must be cleared before fields can be cropped again. Although this kind of land might be bought at an exeremely low price, clearing operations might raise the cost of this land above the valuations used in Table 4. Higher investments in land would make the soil building program still more difficult to finance.

CALCULATED INCOME FOR COWS PRODUCING 10,000 POUNDS OF MILK SELLING AT $4.00 PER HUNDREDWEIGHT AFTER DEDUCTING HAULING CHARGES

Capital Invested. This type of cow and price for milk are considerably above the average for Southeastern Ohio. However, dairy herd improvement records show that a small percentage of farmers are now averaging this amount for the entire herd. This price of milk is the Ohio average for a 3.5 percent grade A product for the period 1950-54.

Estimated capital requirements for this type of farming are shown in Table 8. Land and machinery were valued the same as in Table 4. But value of buildings was increased about $1,500 to produce grade A milk. Buildings were depreciated at the rate of $150 per year. This reduced their value from $7,500 to $5,700.

Values placed on the 10,000 pound cows were one-half higher than the ones used for the 7,000 pound cows in Table 4. This method of appraisal raised the inventory value of livestock from $3,200 the first year to $7,300 for the thirteenth year. Total capital invested increased from $18,700 to $23,000.

Receipts. Gross receipts were calculated to increase from $4,856 to $9,722 for the 13-year period (Table 9). This difference came principally from increasing the sale of milk and old cows from $3,936 to $8,636. Hay and pasture in the thirteenth year would adequately support twice the number of cows that could be kept the first year. Receipts from hogs declined from $920 to $440. But the receipts from wheat increased from $512 the second year to $646 for the thirteenth. A higher yield and a smaller amount fed to hogs made the larger wheat sales possible. Prices used in calculating gross receipts were the same as used in Table 5 except for milk which was figured at $4.00 per

TABLE 8.—Estimated Capital Invested* for 10,000 Pound Cows and $4.00 Net per Hundredweight for Milk

Year	Land and fences	Buildings†	Machinery	Livestock	Total
1st	$3,000	$7,500	$5,000	$3,200	$18,700
2nd	3,800	7,350	5,000	3,800	19,950
3rd	4,200	7,200	5,000	4,400	20,800
4th	4,600	7,050	5,000	4,700	21,350
5th	4,700	6,900	5,000	5,000	21,600
6th	4,800	6,750	5,000	5,300	21,850
7th	4,900	6,600	5,000	5,600	22,100
8th	5,000	6,450	5,000	5,900	22,350
9th	5,000	6,300	5,000	6,300	22,600
10th	5,000	6,150	5,000	6,700	22,850
11th	5,000	6,000	5,000	7,000	23,000
12th	5,000	5,850	5,000	7,300	23,150
13th	5,000	5,700	5,000	7,300	23,000

*Based on 1950-54 prices.
†Includes facilities to produce grade A milk.

hundred pounds instead of $3.00. This higher price for milk along with the greater production per cow increased gross farm receipts about one-half over the figures shown in Table 5.

Expenses. Estimated annual expenses varied only about $300 during the 13-year period (Table 10). Expenses were highest at the beginning of the program because of heavy applications of lime and

TABLE 9.—Calculated Receipts for 10,000 Pound Cows and $4.00 Net per Hundredweight for Milk

Year	Dairy	Hogs	Wheat	Total
1st	$3,936	$920	$ 0	$4,856
2nd	3,936	840	512	5,288
3rd	3,936	800	516	5,252
4th	4,861	720	526	6,107
5th	5,261	920	502	6,683
6th	5,661	840	568	7,069
7th	6,045	720	582	7,347
8th	6,445	600	598	7,643
9th	6,845	640	592	8,077
10th	7,420	560	630	8,610
11th	7,836	480	640	8,956
12th	8,236	440	646	9,322
13th	8,636	440	646	9,722

greater purchases of feed per cow. Annual expenses for machinery, lime, fertilizer, and seed were the same as when 7,000 pound cows were kept. But expenses for feed, building repairs, taxes, insurance, and miscellaneous were slightly higher. These variable items increased annual expenses about $250 above the figures shown in Table 6.

Net Income. If no interest were charged against capital, farm earnings would be sufficient to pay the average farm wage rate after the first year. If a four percent interest charge were made the customary wage rate could be paid after the third year (Table 11). Increase in capital invested also would credit labor with about $ .12 an hour for the 13-year period.

Stated somewhat differently, annual receipts would exceed annual expenses after the third year if labor and capital were allowed no more than customary rates. For the 13-year period as a whole, returns to labor would average about $1.13 an hour after charging four percent interest on all capital invested.

TABLE 10.—Estimated Expenses* for 10,000 Pound Cows and $4.00 Net per Hundredweight for Milk

Year	Feed	Machinery	Lime	Fertilizer	Other	Total
1st	$953	$402	$1,032	$406	$ 828	$3,621
2nd	832	626	624	406	956	3,444
3rd	756	710	624	474	966	3,530
4th	711	700	258	474	980	3,123
5th	781	694	258	474	993	3,200
6th	818	710	258	474	1,004	3,264
7th	758	726	258	474	1,017	3,233
8th	662	747	156	474	1,028	3,067
9th	699	773	156	474	1,041	3,143
10th	718	789	156	474	1,052	3,189
11th	714	805	156	474	1,064	3,213
12th	735	815	156	474	1,074	3,254
13th	761	815	156	474	1,082	3,288

*Includes only cash expenses when no capital is borrowed. Does not include charges for the operator's labor or interest on investment. Depreciation on buildings given in Table 8.

TABLE 11.—Calculated Income and Labor Requirements for 10,000 Pound Cows and $4.00 Net per Hundredweight for Milk

Year	Labor income with		Return per hour of labor with		Hours of labor needed
	No interest charge	4% interest charge	No interest charge	4% interest charge	
1st	$1,235	$ 487	$ .62	$ .25	1,984
2nd	1,844	1,046	.85	.48	2,170
3rd	1,722	890	.75	.39	2,308
4th	2,984	2,130	1.24	.88*	2,414
5th	3,483	2,619	1.36	1.02	2,563
6th	3,805	2,931	1.42	1.09	2,686
7th	4,114	3,230	1.46	1.15	2,815
8th	4,576	3,682	1.55	1.25	2,945
9th	4,934	4,030	1.59	1.30	3,100
10th	5,421	4,507	1.69	1.41	3,207
11th	5,743	4,823	1.74	1.46	3,294
12th	6,068	5,142	1.80	1.52	3,378
13th	6,434	5,514	1.86	1.60	3,454
Average	$4,028	$3,156	$1.44	$1.13	2,794

*A financial statement for the first three years (until annual receipts would be sufficient to pay labor and capital average rates or more) showed the following: total cash receipts, $15,396; expenses, including a payment of $ .75 an hour for labor and four percent interest on capital, $17,819; increase in capital invested, $2,100; loss, $323.

With this type of cow and milk price only about four years would be needed before all costs could be paid out of current farm earnings. This is based on the assumption that labor and capital would be paid no more than average farm rates and credit would be given to annual increases in inventory. If much money were borrowed some outside income probably would be needed for the first few years to make payments on interest and principal. If no more than $2,500 were used annually for family living, interest and principal payments on borrowed money could be made out of farm earnings after the third year.

CALCULATIONS FOR OTHER FARMING SITUATIONS

Although costs and returns were calculated for 30 different farming situations, only two are discussed in detail. Results of the others are summarized briefly in Tables 12 and 13. Table 12 shows the length of time needed to finance the soil building program out of cash

receipts plus changes in inventory. Table 13 shows the length of time needed before annual cash receipts will exceed annual expenses. Farm prices and production costs used in making these calculations are averages for the five-year period 1950-54. Receipts from milk were figured for a 3.5 percent product after deducting hauling charges of $ .35 per hundred pounds.

Table 12 shows the number of years required before the soil building program will pay for itself out of farm earnings. With a milk price of only $2.50 per hundred pounds, farm earnings would never be sufficient to pay all costs of the soil improvement program if production per cow is below 10,000 pounds. Also if the price of milk is $3.00 per hundredweight the same will be true if production per cow is less than 7,000 pounds. This conclusion is based on the assumption that labor will be paid $ .75 an hour plus the use of a house and capital invested will be paid four percent interest.

With average cows (7,000 pounds of milk) and average prices for manufactured milk ($3.00 net per hundredweight) about 45 years would be needed before the soil improvement program would pay for itself out of farm earnings, but with top producing cows and grade A milk prices only about three years would be required.

In these calculations annual increases in the inventory value of livestock and soil resources were credited to farm receipts. Although the inventory value of land and livestock increased as the soil building

TABLE 12.—Years Required Before Soil Building Program Will Pay for Itself Out of Farm Earnings*

(Based on Different Milk Prices† and Production Levels per Cow)

Average milk production per cow	Years required when price of milk per hundred pounds is				
	$2.50	$3.00	$3.50	$4.00	$4.50
6,000 lbs.	‡	‡	25	14	10
7,000 lbs.	‡	45	15	10	6
8,000 lbs.	‡	25	12	7	5
9,000 lbs.	‡	15	9	5	4
10,000 lbs.	75	12	7	4	3
11,000 lbs.	35	10	5	3	2

*Expenses include a charge of $ .75 an hour for labor plus the use of a house and four percent interest on all capital invested. Farm prices and production costs used in making these calculations are averages for the period 1950-54.

†3.5 percent milk after deducting a hauling charge of $ .35 per hundred pounds.

‡This combination will never pay all costs out of farm earnings.

program progressed, these additional farm assets could not be withdrawn from the farm business to pay current operating expenses, or used for family living. However, they could be used as a basis for borrowing additional capital.

If inventory increases were not added to cash receipts more time would be needed to finance the soil improvement program than shown in Table 12. Specifically, this would amount to about two to three years more time for the top producing cows (10,000 and 11,000 pounds of milk) and high milk prices ($4.00 and $4.50 per hundredweight); and about 16 years more time for average cows (7,000 pounds of milk) and one of the low milk prices ($3.00 net per hundred pounds).

Table 13 shows the number of years required before annual cash receipts from the soil rebuilding program will exceed annual expenses including charges for labor and interest on capital invested. With a milk price of only $2.50 per hundred pounds, cash receipts will never be great enough to pay labor and capital average rates if production per cow is below 10,000 pounds. Also, if the price of milk is $3.00 per hundredweight, the same will be true if production per cow is less than 7,000 pounds.

TABLE 13.—Years Required Before Annual Cash Receipts from the Soil Rebuilding Program Will Exceed Annual Expenses Including Charges for Labor and Interest on Capital Invested*

(Based on Different Milk Prices† and Production Levels per Cow)

Average milk production per cow	Years required when price of milk per hundred pounds is				
	$2.50	$3.00	$3.50	$4.00	$4.50
6,000 lbs.	‡	‡	10	8	6
7,000 lbs.	‡	12	9	6	5
8,000 lbs.	‡	10	8	5	4
9,000 lbs.	‡	9	6	4	4
10,000 lbs.	13	8	5	4	4§
11,000 lbs.	12	7	4	4§	4§

*Expenses include a charge of $.75 an hour for labor plus the use of a house and four percent interest on all capital invested. Farm prices and production costs used in making these calculations are averages for the period 1950-54.

†3.5 percent milk after deducting a hauling charge of $ .35 per hundred pounds.

‡This combination will never pay labor and capital average rates out of cash receipts.

§These figures are higher than the corresponding ones in Table 12 because of the way inventory increases were handled. In Table 12 inventory increases were included in gross receipts; in Table 13 only cash receipts were considered as farm income.

With average cows (7,000 pounds of milk) and average prices for manufactured milk ($3.00 net per hundred pounds) about 12 years would be needed before annual cash receipts from the soil improvement program would exceed annual expenses including charges for labor and interest on capital invested. But with the best cows and grade A milk prices only about four years would be required.

Preceding calculations show that above average cows and milk prices will be needed if a soil improvement program is to be financed out of current farm earnings. This will be especially true if new buildings and fences are constructed, or large amounts of brush are cleared from the cropland and permanent pasture areas. Top producing cows and high milk prices produced about twice as much gross income as low producing cows and poor milk prices. But total farm expenses for the better cows and milk prices were only about 15 percent greater.

Consideration also was given to the economics of improving the dairy herd along with the establishment of the soil improvement program. Production per cow was raised from 7,000 to 10,000 pounds. Calves from high producing herds were assumed to be purchased the first four years for replacement purposes. But from the fifth year on calves from 10,000 pound cows could be raised so that no further purchases would be necessary. Expenses would be kept to the minimum by using this method of improving the dairy herd. However, the production of all cows would not average 10,000 pounds until the seventh year had been reached.

This farm situation showed greater profits than could have been obtained from 7,000 pound cows over the 13-year period. But it did not make the first three years of the soil improvement program any easier to finance because milk production per cow remained at 7,000 pounds until the fourth year. Also purchased calves cost slightly more than raising them.

Preceding calculations show that farm earnings from better than average cows and milk prices would more than pay labor and capital the customary rates over a 13-year period. Arguments might be made, however, that above average management should receive above average wage rates. If this approach had been used, some of the situations studied would not have been as profitable as figures indicate.

Although a soil building program may be profitable with the right kind of management, returns from a given amount of labor and capital applied to a highly productive farm could often be more profitable. Also a job in town might still be a better alternative, especially for an average farmer who does not possess the necessary skills and capital needed.